Performance Comparison of Single and Double Pass Solar Air Collectors for Flat Plate and V-Groove

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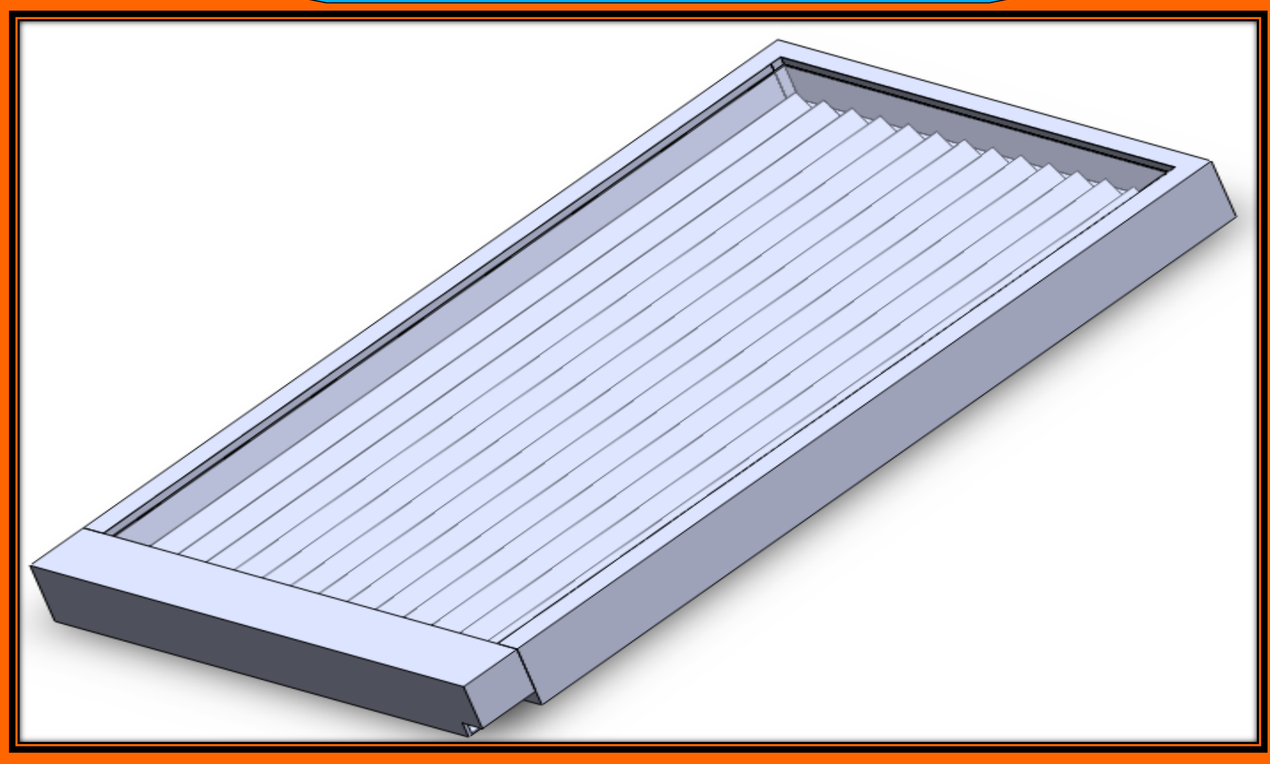
Introduction

- This paper compared the thermal performance of four type of collectors, namely 1) Flat Plate Single Pass , 2) Flat Plate Double Pass, 3) V-groove Single Pass and 4) V-groove Double Pass.
- Mathematical model was developed for these type of collectors and simulation was carried out using MATLAB software.
- Factors that affect the efficiency of the collectors have been identified.

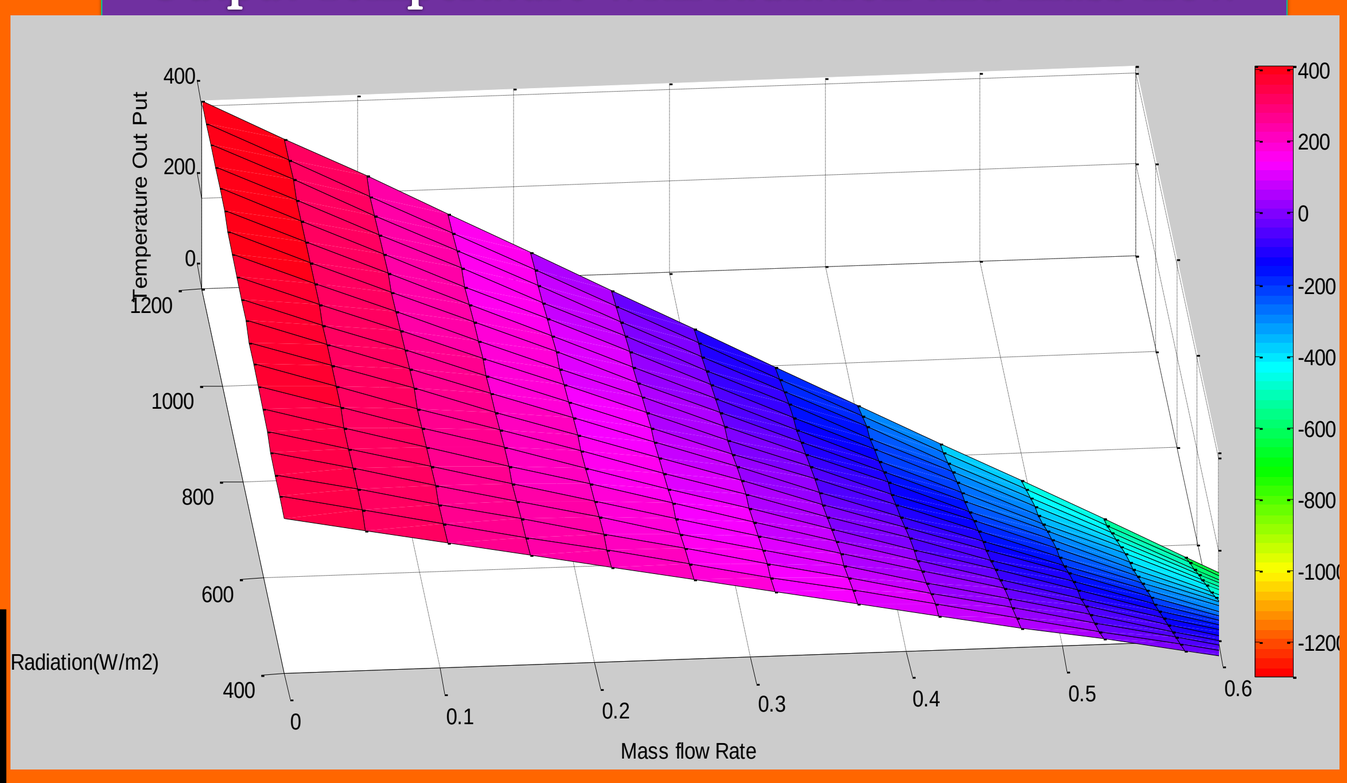
V-Grove Solar Air Collector

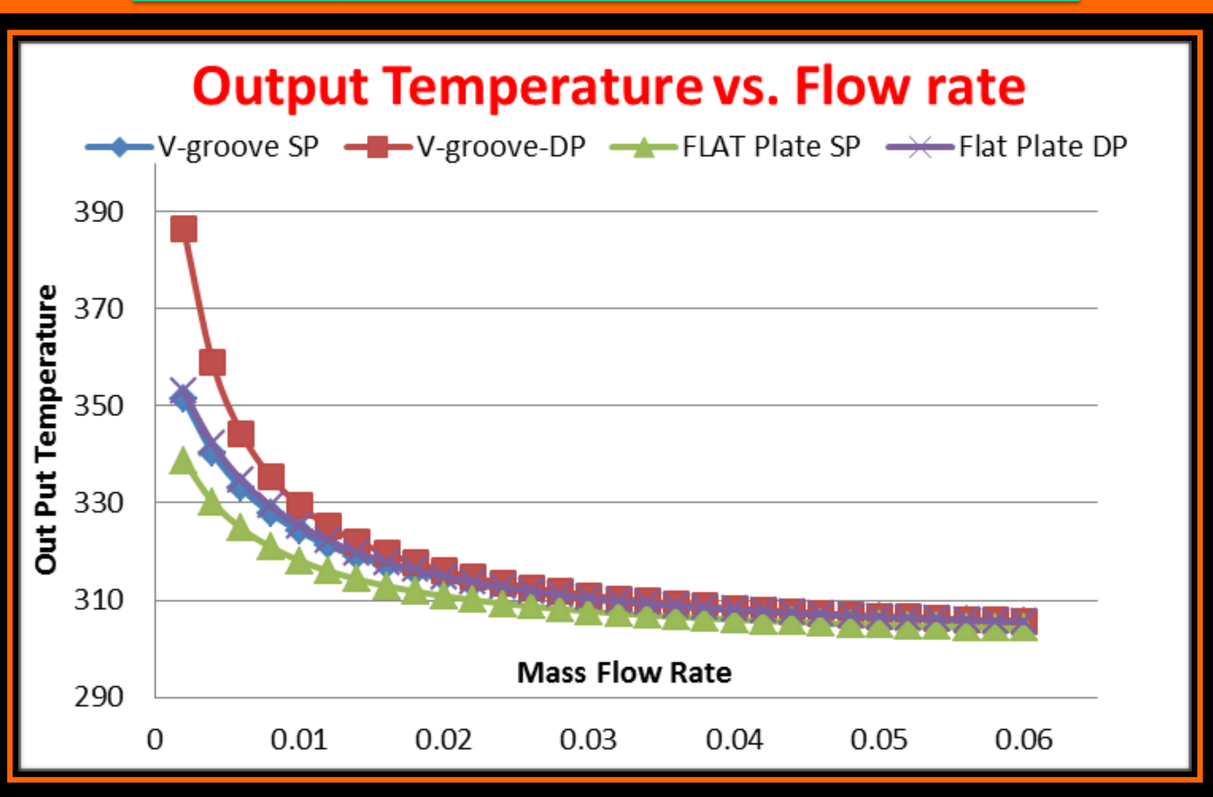


Simulation Parameter

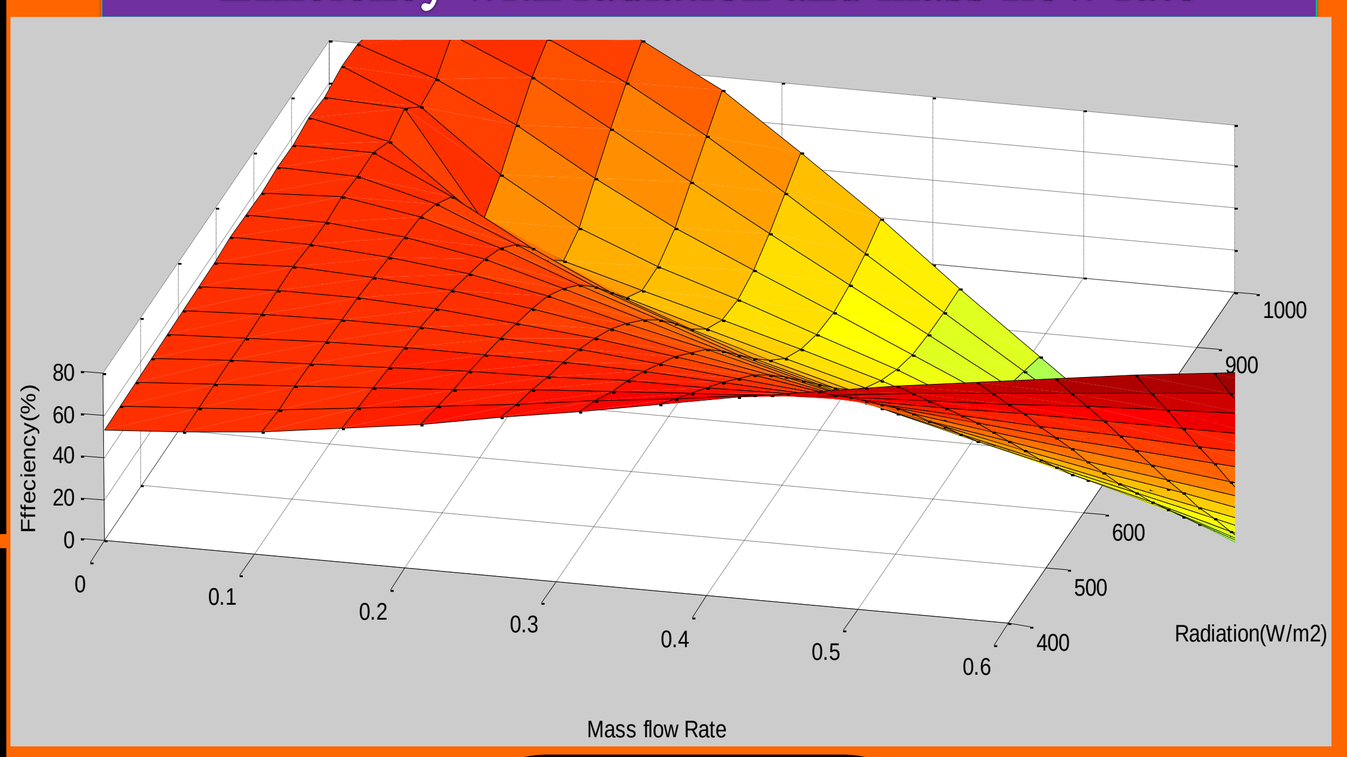
I	**600**	**W/m²**	**ε_{ap}**	**0.94**	
θ	30	degrees	**ε_{bp}**	0.9	
W	1	m	**ε_c**	0.94	
L	2	m	**α_{ap}**	0.06	
H_g	0.05	m	**α_c**	0.95	
H_c	0.025	m	**τ_c**	0.84	

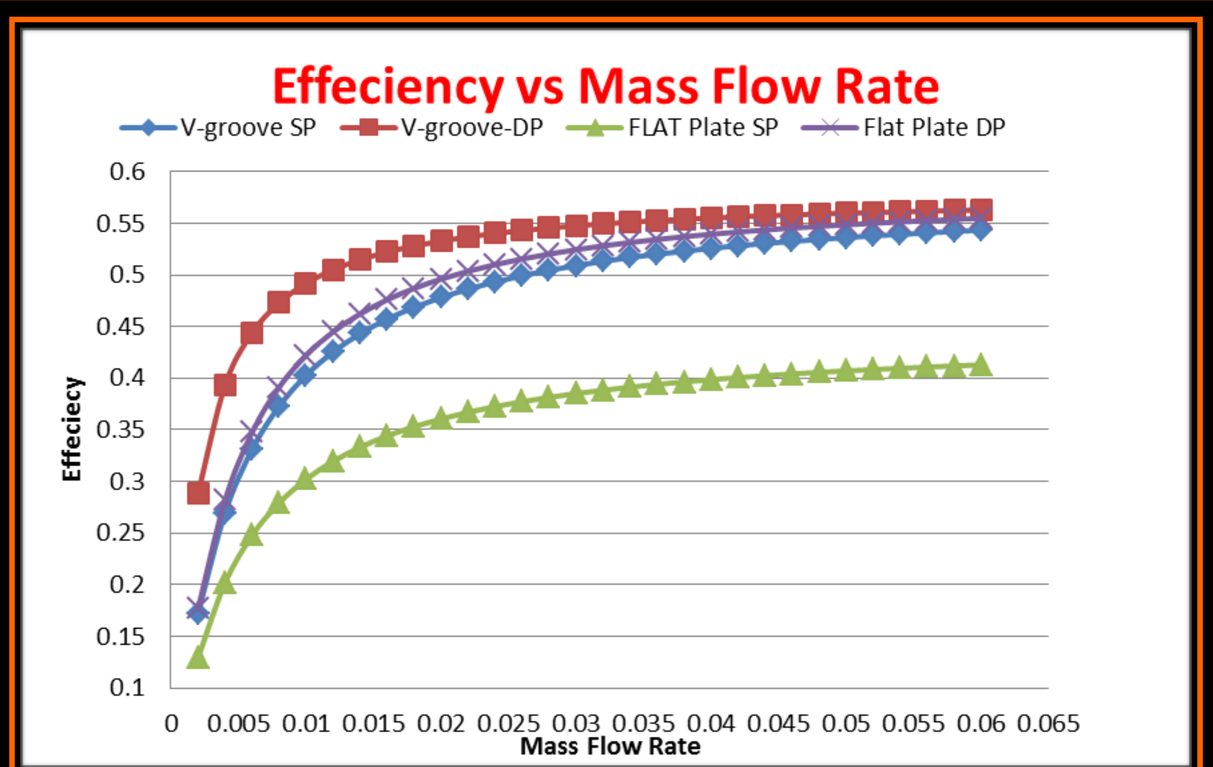
Output Temperature with radiation and mass flow





Efficiency with radiation and mass flow rate





Conclusion

- Performance curves of flat plate and v-groove collectors with single and double pass have been obtained.
- From the simulation it is found that V-groove double pass air collector has the highest efficiency value of 56%
- Based on the comparative study between flow rate and radiation, the thermal performance of the solar collector is found to be strongly dependent on the flow rate.